

# इंटरनेट

# मानक

## Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 3107 (1974): Specification for Portable Multipurpose Direct Acting Electrical Indicating Instruments [ETD 31: Power Electronics]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”



BLANK PAGE



IS : 3107 - 1974

(Reaffirmed 1993)

REAFFIRMED

JAN 2005

*Indian Standard*

**SPECIFICATION FOR  
PORTABLE MULTIPURPOSE DIRECT ACTING  
ELECTRICAL INDICATING INSTRUMENTS**

**( First Revision )**

**Third Reprint JUNE 2000  
( Incorporating Amendments No. 1 and 2 )**

UDC 621.317.7

© Copyright 1987

**BUREAU OF INDIAN STANDARDS  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002**

# *Indian Standard*

## SPECIFICATION FOR PORTABLE MULTIPURPOSE DIRECT ACTING ELECTRICAL INDICATING INSTRUMENTS

### ( *First Revision* )

Electrical Instruments Sectional Committee, ETDC 48

*Chairman*  
PROF (DR) J. K. CHOUDHARY  
Jadavpur University,  
Calcutta

<i>Members</i>	<i>Representing</i>
SHRI K. R. BANERJEE	Instrumentation Ltd, Kota
SHRI S. K. GOYAL ( <i>Alternate</i> )	National Physical Laboratory (CSIR), New Delhi
SHRI V. K. BATRA	National Test House, Calcutta
DR A. S. BHADURI	Directorate of Technical Development
SHRI B. P. GHOSH ( <i>Alternate</i> )	Production (Air), New Delhi
WG CDR H. S. BHATIA	Directorate General of Supplies & Disposals
SHRI M. K. KULSHRESTHA ( <i>Alternate</i> )	( Inspection Wing ), New Delhi
SHRI J. L. CHHABRA	Controllorate of Inspection Electronics ( Ministry of Defence ), Bangalore
SHRI J. P. PASSI ( <i>Alternate</i> )	Institute for Design of Electrical Measuring Instruments, Bombay
COL R. C. DHINGRA	Development Commissioner, Small Scale Industries ( Ministry of Industrial Development ), New Delhi
SHRI N. NARAYANA RAO ( <i>Alternate</i> )	Directorate General of Posts & Telegraphs ( Department of Communications ), New Delhi
SHRI R. N. GANDHI	All India Instruments Manufacturers' & Dealers' Association, Bombay
SHRI G. CHANDRASEKHARAN ( <i>Alternate</i> )	
SHRI A. N. GHOSH	
SHRI R. K. ARORA ( <i>Alternate</i> )	
SHRI K. B. KAMAT	
SHRI S. C. MUKHERJEE ( <i>Alternate</i> )	
SHRI S. D. KULKARNI	
SHRI B. K. GARODIA ( <i>Alternate</i> )	

( Continued on page 2 )

© Copyright 1987

BUREAU OF INDIAN STANDARDS

This publication is protected under the *Indian Copyright Act* (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

**IS : 3107 - 1974**

*( Continued from page 1 )*

<i>Members</i>	<i>Representing</i>
<b>SHRI J. R. MAHAJAN</b>	Indian Electrical Manufacturers' Association, Bombay
<b>SHRI S. P. RANADE ( Alternate )</b>	
<b>SHRI S. S. MAVI</b>	Department of Industries, Government of Punjab, Chandigarh
<b>SHRI K. L. KOHLI ( Alternate )</b>	
<b>SHRI K. P. R. NAMBIAR</b>	British Physical Laboratories India Pvt Ltd, Bangalore
<b>SHRI K. GOPAL ( Alternate )</b>	
<b>SHRI E. N. NARAYANASWAMY</b>	Department of Industries and Commerce, Government of Tamil Nadu, Madras
<b>SHRI P. V. N. AMANATHAN</b>	Central Scientific Instruments Organization ( CSIR ), Chandigarh
<b>DR R. N. MATHUR ( Alternate )</b>	
<b>SHRI K. N. RAMASWAMY</b>	Directorate General of Technical Development, New Delhi
<b>SHRI M. K. BANERJEE ( Alternate )</b>	
<b>SUPERINTENDENT ( ELECTRICAL )</b>	Research, Designs & Standards Organization ( Ministry of Railways ), Lucknow
<b>DR G. R. TOSHNIWAL</b>	Toshniwal Industries Pvt Ltd, Ajmer
<b>SHRI S. C. MAHESHWARI ( Alternate )</b>	
<b>SHRI S. VEERARAGHAVAN</b>	The Bombay Electric Supply and Transport Undertaking, Bombay
<b>SHRI A. D. LIMAYE ( Alternate )</b>	
<b>SHRI M. S. WANDALKAR</b>	Heavy Electricals ( India ) Ltd, Bhopal
<b>SHRI S. K. KASLIWAL ( Alternate )</b>	
<b>SHRI N. SRINIVASAN, Director ( Elec tech )</b>	Director General, ISI ( <i>Ex-officio Member</i> )

*Secretary*

**SHRI HAROHARAN SINGH**  
Assistant Director ( Elec tech ), ISI

# *Indian Standard*

## SPECIFICATION FOR PORTABLE MULTIPURPOSE DIRECT ACTING ELECTRICAL INDICATING INSTRUMENTS ( *First Revision* )

### 0. FOREWORD

**0.1** This Indian Standard ( First Revision ) was adopted by the Indian Standards Institution on 4 July 1974, after the draft finalized by the Electrical Instruments Sectional Committee had been approved by the Electrotechnical Division Council.

**0.2** This standard which covers portable multipurpose electrical indicating instruments was originally issued in 1965. The Sectional Committee responsible for the preparation of this standard felt that this standard should be completely aligned with the revised edition of IS : 1248-1968\*. This revision has been undertaken to line up this standard, especially from the point of view of accuracy concept with IS : 1248-1968\*.

**0.3** The portable multipurpose direct acting electrical indicating instruments are being widely used as test instruments in electrical and electronic engineering and allied fields because of their versatility in measuring the various parameters involved by simple adjustments. With the rapid development of electrical and electronic industry in the country, the demand of such instruments has been ever on the increase. The need has, therefore, been felt for having a specification with a view to laying down the minimum requirements for such instruments which would serve as a guidance to the manufacturers and users.

**0.4** IS : 1248-1968\* covers the requirements and tests applicable to electrical indicating instruments generally. The provisions of this standard are intended to apply in addition to those of IS : 1248-1968\*, which is a necessary adjunct to this standard. Should any deviation exist between IS : 1248 - 1968\* and this standard, the provisions of the latter shall prevail.

**0.5** It is recognized that for portable multipurpose direct acting electrical indicating instruments for use in special cases ( for example, defence )

---

\*Specification for direct acting electrical indicating instruments ( *First Revision* ).

special provisions may be necessary. In such cases additional requirements should be separately specified.

**0.6** The manufacturer of the portable multipurpose electrical indicating instruments is expected to supply certain additional information which is given in Appendix A.

**0.7** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS: 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

---

## **1. SCOPE**

**1.1** This standard applies to portable multipurpose direct acting electrical indicating instruments of permanent magnet moving coil type used as test instruments.

**1.2** It does not apply to portable multipurpose direct acting electrical indicating instruments using electronic devices except semiconductor devices.

## **2. TERMINOLOGY**

**2.0** For the purpose of this standard, the following definitions, in addition to those given in IS : 1248-1968† shall apply.

**2.1 Multipurpose Instrument** — An instrument in which measuring circuit(s) is (are) adopted to measure more than one kind of quantity, that is, current, voltage and resistance.

**2.2 Sensitivity** — The current required for full scale deflection of the instrument, while measuring voltage. It is the inverse of this current and is expressed in ohms volt

## **3. CLASSIFICATION**

**3.0** Portable multipurpose direct acting electrical indicating instruments shall be classified according to their accuracy class.

**3.1** The instruments shall have an accuracy class chosen from Table 1 corresponding to the appropriate measurement.

---

\*Rules for rounding off numerical values (*revised*).

†Specification for direct acting electrical indicating instruments (*first revision*).



**TABLE 1 ACCURACY CLASSIFICATION**

( Clause 3.1 )

MEASUREMENT	ACCURACY CLASS
dc	0.5, 1.0, 1.5, 2.5 and 5.0
ac	1.0, 1.5, 2.5, and 5.0
Resistance	1.0, 1.5, 2.5 and 5.0

NOTE — Multipurpose or multirange instruments may have more than one accuracy class.

**3.2 Interchangeable accessories** ( also accessories with limited interchangeability ) shall have one of the following classes:

0.2, 0.5, 1.0, 1.5 and 2.5

#### **4. CONSTRUCTIONAL REQUIREMENTS**

**4.0 General** — The provisions of IS : 1248-1968\* shall apply in addition to those of 4.1 to 4.5.

**4.1 Construction** — The instrument shall be self-contained except for the associated test leads and prods and clips; no other external accessory shall be necessary for measurement in any of the specified self-contained ranges of the instrument. However, extra accessory may be required for extension of measurement ranges ( see 4.6.2 ).

**4.1.1** The components, such as resistors, rectifiers, switches, terminals etc, employed in the instrument shall conform to the relevant Indian Standards, where available.

**4.1.2** Construction shall be such that there shall not be any drain on the internal batteries when the instrument is not in use.

#### **4.2 Range Selection**

**4.2.1** For the purpose of selection of particular range required, either multi-position rotary selector switches or socket points shall be provided. The multipurpose rotary selector switches used shall be capable of operation on both ac and dc without arcing or disturbing the external circuit during changeover of switch position with the instrument connected to the test circuit. The interlocking of the switches shall be so arranged that no more than one quantity to be measured can be set at a time.

**4.2.2** There shall be provision for disconnecting the instrument from the external circuit and to simultaneously short circuit the instrument movement to provide damping and protection during transit.

\*Specification for direct acting electrical indicating instruments ( *first revision* ).

### **4.3 Power Supply**

**4.3.1** The instrument measuring resistance shall be designed for operation from dry cells, the number, type and voltage of dry cells required shall be as specified by the manufacturer.

**4.3.2** A housing for the dry cells shall be provided in the instrument itself, the dimensions of which shall be suitable for accommodating the required number of dry cells. The dry cell housing shall be suitably isolated so that other components do not get damaged in case of cell deterioration. The design of the housing shall provide effective contact and easy replacement of cells.

**4.3.3** In case of instruments measuring resistance, battery compensator shall be provided to enable the use of dry cells till their terminal voltage on load ( test leads shorted on a given resistance measuring range ) drops to 90 percent of nominal voltage.

### **4.4 Overload Protection**

**4.4.1** The instrument shall have a suitable overload protection achieved either by electromechanical or electrical means. The overload protection device shall be effective on all the ranges of the portable multipurpose direct acting electrical indicating instrument.

**4.4.2** In the case of electromechanical protection device, the minimum operating current or voltage and the time delay which shall be declared by the manufacturer shall be sufficient to protect the instrument from excessive current passing through it till the time of operation of the device.

**4.4.3** The resetting control when provided shall be easily accessible and it shall not restore until reset manually.

### **4.5 Terminals**

**4.5.1** The terminals may be either of screwed type or socket type and shall be insulated. The terminals shall be designed to provide shake-proof contact with the test lead ends. Terminals shall be located sufficiently apart so that easy connection with the test leads is facilitated. The polarity of the terminal shall be distinctly marked to indicate clearly the proper direction of current through the instrument.

**4.5.1.1** If the terminals are of screwed type, the head shall be non-detachable.

### **4.6 Accessories**

**4.6.1** *Test Leads, Prods and Clips* — The length of each test lead shall be not less than 1 m. The lead shall be single core unkinkable flexible conductor, having a conductor size suitable for measurement of the

magnitude of the quantity involved [ see IS : 1554 ( Part I )-1964\* ]. The test leads shall have sufficient insulation strength. The leads shall be adequately protected at the ends to withstand strain in normal use. The leads shall be coloured red and black.

**4.6.1.1** The test prods which shall be connected to the ends of the test leads shall be suitably insulated and shall have pointed ends. They shall also be coloured red and black.

**4.6.1.2** The test clips shall be capable of being slid on to the test prods or capable of being fitted to the test leads in place of the test prods.

**4.6.1.3** The contact parts of test prods and clips shall be given a rust-proof metal coating ( see IS : 1068-1958† ).

**4.6.2 Accessories for Extension of Instrument Ranges** — The following accessories may be provided by agreement between the supplier and the purchaser:

- a) dc and ac multipliers,
- b) current transformers,
- c) shunts for extension of dc current ranges,
- d) batteries for extension of ranges of instruments measuring resistance, and
- e) attachments for low resistance ranges.

**4.7 Carrying Case** — If required by the purchaser, a suitable carrying case, shall be provided. It shall also accommodate all the accessories.

## 4.8 Instructions

**4.8.1 Instruction Plate** — An instruction plate embodying brief operating instructions shall be suitably affixed to the instrument.

**4.8.2 Operating Manual** — An operating manual containing detailed specifications, operating instructions, schematic diagrams of the instrument circuits and a list of parts shall be supplied with each instrument.

## 5. QUANTITIES MEASURED

**5.1** The instrument shall normally measure, the following quantities in different specific ranges:

- a) Voltage ( ac and/or dc ),

---

\*Specification for PVC insulated ( heavy duty ) electric cables: Part I For working voltages up to and including 11 000 volts ( revised ).

†Specification for copper, nickel and chromium electroplated coatings. ( Since revised ).

- b) Current ( ac and/or dc ), and
- c) Resistance.

**5.2** The ranges for measurement of low resistance, capacitance, inductance and power ( in watts or decibels ) shall also be provided, if required by the purchaser.

## 6. MEASUREMENT RANGES

**6.1 Current, Voltage and Resistance Measurements** — The upper limits of the effective range of instruments shall preferably be chosen from the following values or their multiples of 10:

1, 3 and 10

**6.1.1** The maximum value of lower limits of effective range shall be in conformance with 5.1.2 of IS : 1248-1968\*.

**6.2 dB Scale** — Where used, the upper limit of dB ranges shall preferably correspond to the following voltage or current values or their multiples of 10:

1,  $\sqrt{10}$  and 10

## 7. SENSITIVITIES

**7.1** The minimum values of sensitivities shall be as given in Table 2.

**TABLE 2 SENSITIVITIES**

MEASUREMENT	SENSITIVITY, <i>Min</i> ohms/volt
dc	10 000
ac	1 000*

\*Sensitivity for ac holds good for ranges with upper limits of effective range of 10 volts and above.

## 8. INTRINSIC ERRORS

**8.1 Instruments and Non-interchangeable Accessories** — When the portable instrument is under the reference conditions ( *see* 6.1 of IS : 1248-1968\* ) and is used between the limits of effective range, the intrinsic error shall not exceed the limits given in Table 3 as a function of class index.

**8.1.1** The reference range for frequency shall be from 20 Hz to 3 kHz.

**8.2 Interchangeable Accessories ( Also Accessories with Limited Interchangeability )** — The intrinsic errors expressed as a percentage of

\*Specification for direct acting electrical indicating instruments ( *first revision* ).

the rated value, under the reference conditions ( *see* 6.2 of IS : 1248-1968\* ), shall not exceed the limits given in Table 4 as a function of the class index.

**TABLE 3 LIMITS OF INTRINSIC ERRORS FOR INSTRUMENTS AND NON-INTERCHANGEABLE ACCESSORIES**  
( *Clause 8.1* )

(1)	(2)	(3)	(4)	(5)	(6)
Class index	0.5	1.0	1.5	2.5	5.0
Limit of intrinsic error (%)	$\pm 0.5$	$\pm 1.0$	$\pm 1.5$	$\pm 2.5$	$\pm 5.0$

**TABLE 4 LIMITS OF INTRINSIC ERRORS FOR INTERCHANGEABLE ACCESSORIES**

(1)	(2)	(3)	(4)	(5)	(6)
Class index	0.2	0.5	1.0	1.5	2.5
Limit of error (%)	$\pm 0.2$	$\pm 0.5$	$\pm 1.0$	$\pm 1.5$	$\pm 2.5$

NOTE — The overall accuracy limits shall be the sum of the accuracy limits of the instrument and its accessories.

## 9. LIMITS OF VARIATIONS IN INDICATION

9.1 The provisions of 7 of IS : 1248-1968\* shall apply.

9.1.1 The portable multipurpose instruments are not required to be tested for the effect of panel mounting.

## 10. MARKING

10.1 The instrument shall bear on the scale plate, or on one of the external surfaces, the following markings, in addition to the relevant markings of 8 of IS : 1248\* :

a) Sensitivities in ohms/volt for both ac and dc voltage range; and

NOTE — The sensitivities to be marked shall be the best sensitivities.

b) The accuracy class indicated by the class index ( symbols in A-5.1 to A-5.4 of IS : 1248-1968\* ) in bold print by the side of the symbol for reference position [ *see* 8.1.2(c) of IS : 1248-1968\* ] or if this is non-existent, in its place. When an instrument is intended to measure both direct and alternating quantities and has a different class index for each of these quantities, the class indices shall be indicated one above each other in the same order as the symbols indicating the nature of the quantities.

\*Specification for direct acting electrical indicating instruments ( *first revision* ).

## 10.2 The product may also be marked with Standard Mark

**10.2.1** The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

## 11. TESTS

**11.1** The provisions of 9 of IS : 1248-1968\* shall apply except the following modifications to the tests enumerated below.

**11.1.1** *Insulation Resistance* (see 9.2 of IS : 1248-1968\*) — The test shall be carried out with the test leads and test prods connected to the instrument.

**11.1.2** *High Voltage* (see 9.3 of IS : 1248-1968\*) — The test shall be carried out with the test leads and test prods connected to instrument.

**11.1.3** *Overload Test* (see 9.7 of IS : 1248-1968\*) — The test shall be carried out with overload protection kept inoperative. The test for overloads of short duration shall be done at the highest values of the ac/dc voltage and current ranges.

**11.1.4** *Vibration Test* (see 9.9 of IS : 1248-1968\*) — The vibration test [see IS : 2106 (Part XVI)-1971†] shall be carried out on all the portable multipurpose instruments having an accuracy class worse than 1.0 even on a single range. The vibration severities shall be as given below:

<i>Frequency Range</i> Hz	<i>Amplitude</i>	<i>Duration</i> h	<i>Endurance Procedure</i>
10 to 150	0.15 mm (2 g)	6	Endurance at resonance frequency, in most unfavourable direction

If direction is not known vibration shall be applied for 2 h in each of the three mutually perpendicular directions. If no resonance is observed the equipment shall be subjected to vibration at each of the frequencies 25, 50, 100 and 150 Hz for 1.5 h, that is, total duration shall not exceed 6 h

\*Specification for direct acting electrical indicating instruments (*first revision*).

†Environmental tests for electronic and electrical equipment: Part XVI Vibration test.

**11.1.5 Measurement of Sensitivity** — Connect the instrument in series with a suitable current measuring device and measure the current required for full scale deflection for any of the ac and dc voltage ranges above 10 V. The accuracy of the measurement shall be  $\pm 5$  percent.

**Norm** — The sensitivity test is a type test. It is additional to the tests specified in 9.1.1 of IS : 1248-1968\*.

**11.1.6 Life Test** ( see 9.10 of IS : 1248-1968\* ) — The life test shall be carried out at the lowest value of the dc current range.

## APPENDIX A

( Clause 0.6 )

### ADDITIONAL INFORMATION TO BE SUPPLIED BY THE MANUFACTURER

#### A-1. ADDITIONAL INFORMATION TO BE SUPPLIED

**A-1.1** The manufacturer of the portable multipurpose direct acting electrical indicating instruments shall supply the additional information relating to the following:

- a) Type of protection,
- b) Battery supply voltage for the resistance range,
- c) Accuracy classes for all ranges,
- d) Sensitivities for all voltage ranges,
- e) Frequency response, and
- f) List of accessories.

---

\*Specification for direct acting electrical indicating instruments (first revision).

## BUREAU OF INDIAN STANDARDS

### Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones: 323 0131, 323 3375, 323 9402 Fax :+ 91 011 3234062, 3239399, 3239382

E - mail : bis@vsnl.com. Internet : http://wwwdel.vsnl.net.in/bis.org

### Central Laboratory:

Plot No. 20/9, Site IV, Sahibabad Industrial Area, Sahibabad 201010

### Telephone

477 00 32

### Regional Offices:

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002 323 76 17

\*Eastern : 1/14 CIT Scheme VII, V.I.P. Road, Kankurgachi, CALCUTTA 700054 337 86 62

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022 60 38 43

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113 235 23 15

†Western : Manakalaya, E9, MIDC, Behind Marol Telephone Exchange,  
Andheri (East), MUMBAI 400093 832 92 95

### Branch Offices:

'Pushpak', Nurmohamed Shaikh Marg, Khanpur, AHMEDABAD 380001 550 13 48

†Peenya Industrial Area, 1st Stage, Bangalore-Tumkur Road,  
BANGALORE 560058 839 49 55

Commercial-cum-Office Complex, Opp. Dushera Maidan, E-5 Arera Colony,  
Bittan Market, BHOPAL 462016 72 34 52

62/63, Ganga Nagar, Unit VI, BHUBANESWAR 751001 40 36 27

5th Floor, Koval Towers, 44 Bala Sundaram Road, COIMBATORE 641018 21 88 35

Plot No. 58, Neelam Bata Road, NIT, FARIDABAD 121001 42 82 60

Savitri Complex, 116 G.T. Road, GHAZIABAD 201001 471 19 98

53/5 Ward No.29, R.G. Barua Road, 5th By-lane, Apurba Sinha Path,  
GUWAHATI 781003 54 11 37

5-8-56C, L.N. Gupta Marg, Nampally Station Road, HYDERABAD 500001 320 10 84

E-52, Chitrangan Marg, C- Scheme, JAIPUR 302001 37 38 79

117/418 B, Sarvodaya Nagar, KANPUR 208005 21 68 76

Seth Bhawan, 2nd Floor, Behind Leela Cinema, Naval Kishore Road,  
LUCKNOW 226001 21 89 23

NIT Building, Second Floor, Gokulpat Market, NAGPUR 440010 52 51 71

Patliputra Industrial Estate, PATNA 800013 26 28 08

First Floor, Plot Nos. 657-660, Market Yard, Gultekdi, PUNE 411037 426 86 59

'Sahajanand House' 3rd Floor, Bhaktinagar Circle, 60 Feet Road,  
RAJKOT 360002 37 82 51

T.C. No. 14/1421, University P. O. Palayam, THIRUVANANTHAPURAM 695034 32 21 04

\*Sales Office is at 5 Chowringhee Approach, P.O. Princep Street,  
CALCUTTA 700072 237 10 85

†Sales Office is at Novelty Chambers, Grant Road, MUMBAI 400007 309 65 28

†Sales Office is at 'F' Block, Unity Building, Narashimaraja Square,  
BANGALORE 560002 222 39 71